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DIVISION OF TIMBER MANAGEMENT
REGION 4 FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE

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1972 GROUND SURVEY OF MOOSE CREEK PLATEAU TARGHEE NATIONAL FOREST

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1972 GROUND SURVEY OF MOOSE CREEK PLATEAU
TARGHEE NATIONAL FOREST

A ground survey was conducted in the fall of 1972 within the Moose Creek Plateau Timber Sale on the Targhee National Forest by Regional Office entomologists. The purpose of the survey was to collect data on the current status of the mountain pine beetle (MPB) infestation within the lodgepole and white bark pine on this sale area.

The general buildup ratios and direction of spread determined by this survey closely paralleled those of the aerial photo survey of the entire Moose Creek Plateau by Klein (1).

There is adequate documentation of the progress of the MPB infestation on the Targhee National Forest during the past 13 years as it has moved north and east across the Forest from the lodgepole pine stands on the Rexburg District infested in 1960 to its present location within the Moose Creek Plateau area in the northeast portion of the Forest. The destruction caused by this beetle in the form of tree mortality, canceled sales and losses of other investments in forest management is also recorded.

These previous experiences of canceled sales, uncompleted roads, and unregenerated stands make it important to assess the extent of the invasion of the Moose Creek Plateau sale area by the bark beetle and prompted a prognostication of tree losses in the next 2 to 3 years.

METHODS

A systematic sampling method was selected which utilized continuous strip plots, 1/2-chain wide by 10-chains long. The strip plot was determined by Parker (2) to be the most efficient in terms of plot measurement and sampling cost per tree. The survey utilized a two-man team. The lead man measured the length of the sample by pacing and kept direction with a Sunto compass; the second man followed and searched the area within the strip for infested trees. By having the lead man drag a 200-foot line behind him to mark the center of the sample, infested trees were determined to be either in or out of the sample by measuring 16.5 feet at right angles from the centerline marked by the rope.

The trees attacked in 1971 (redtops) and 1972 (green) were recorded by 2-inch diameter classes on continuous strip plots 1/2 chain wide by 10 chains long. The green stand and tree mortality which occurred previous to 1971 were recorded from variable plots taken every 10 chains along the sample line. All trees within the variable plots were recorded by 2-inch diameter class by species.

BACKGROUND

There are four factors that are known to influence the number of trees infested in a given area. These are beetle populations in adjacent stands, tree size, density of large trees and elevation. Tree mortality in attacked stands becomes greater with increases in tree diameter, numbers of large trees per acre, and currently infested trees in adjacent stands. Tree mortality is also greater at lower elevations and decreases at higher elevations.

A cursory examination of this sale area revealed that all four of these factors varied so widely that stratified sampling was necessary The following variations were identified within the sale area:

1. The elevation of the sale area involves a difference of 2,000 feet from a low of approximately 6,200 feet on the west edge to an upper elevation of over 8,200 feet on the east. Beetle populations in stands below 7,000 feet elevation are probably not affected by weather, while those which attack stands which occur between 7,000 and 8,000 feet may be influenced by changes in weather from year to year. Beetles in stands above 8,000 feet are usually subject to a short tree-growing season and cooler summers which lengthen the life cycle of the developing broods. Occasionally, as much as two years may be required for their development.

2. Extensive areas within the sale are covered by stagnated second growth stands, composed of a large number of stems per acre, with few, if any, trees over 6 inches d.b.h. These stands, probably the result of old burns, occur at all elevation levels. Because the bark of the trees in these stands is so thin, they can be considered immune to attack; they are also unsuitable for harvest.

3. The general appearance of the stands below 7,500 feet is significantly different from those above. In the lower elevation stands, trees 12 inches in diameter and above are noticeably fewer and more scattered. Those remaining are often heavily mistletoed, of poor form, or are otherwise undesirable for lumber. Old roads, trails, cut stumps, cabin sites and old marking blazes indicate that trees have been harvested from the lower more accessible areas for a long period of time. The trees at the higher elevations are generally larger with more evidence of natural deterioration. Trees with dead tops and multiple stems are much more common. Trees were also generally much shorter for their diameter than in the lower elevation stands although no heights were taken.

4. The infestation approaching the Moose Creek Plateau sale was concentrated south of the sale area, although some infestation exists west of the sale as well as within the sale itself. The susceptibility of a stand to attack is, in part, related to its proximity of an infested stand, therefore, the stands in the southern portion of the sale are more vulnerable to attack than those in the northern part.

STAND DESCRIPTIONS AND SUSCEPTIBILITY

Since different parts of the sale were influenced differently by one or more of the four factors mentioned, it was obvious that the level of infestation would not be equal throughout the survey area and that some determination of susceptibility by area was necessary. The most obvious was to exclude the stagnated stands which were relatively immune to attacks. Fortunately, these had been already delineated and mapped. Susceptible stands were separated into the following units with similar potential for beetle attacks: (see map).

I. A. Chick Creek

B. Split Creek

These areas are similar enough to be considered together. Although they are adjacent to heavy beetle populations southwest of the sale area and lie at the lowest elevation, they have been rather severely cutover in the past, and in addition, a significant amount of clearcutting in alternate 5-chain-wide strips has been done on the current sale.

C. Trude Siding. This unit is the western-most part of the sale area. It is a low elevation stand but does not appear to have been as extensively cutover in the past as Chick and Split Creeks nor is any current logging being done. Access to the area is poor, particularly for timber removal, because of the development of cabin sites on the adjacent private land.

II. Middle Fork. This is the southern-most unit in the sale area and, therefore, has the greatest exposure to the advancing beetle infestation. Most of the unit is just under 8,000 feet and it is possible that the population could be affected by weather. Except for the eastern boundary which adjoins Yellowstone National Park, this small unit is surrounded by rather extensive stands of unsusceptible stagnated pole-sized stands.

III. A. Upper Chick Creek South and

B. Upper Chick Creek North

These units in the upper, eastern areas of Chick Creek were separated for analysis purposes. Due to a 1,000-foot range in elevation (7,200 to 8,200), the unit probably represents a cross-section of the beetle activity in the areas above 7,000 feet. However, the unit has been quite heavily harvested in alternate clearcut strips in the last 5 years. No indications of past cutting in the remaining strip were found.

IV. A. Upper Moose Creek #1

B. Upper Moose Creek #2

Again, this unit was divided to accommodate the capacity of the computer. It adjoins the Upper Chick Creek Unit (III) on the north but does not extend into the upper elevations. Since this unit lies to the north of Chick Creek unit and the progress of the beetle population is to the northeast, the Moose Creek unit could be expected to follow an infestation pattern similar to Upper Chick Creek with a year or two delay.

V. A. Lower Black Canyon

B. Upper Black Canyon

These two units are in the northeastern most portion of the sale area and, therefore, most distant from beetle population reservoirs. They are generally in the upper elevation near or exceeding

8,000 feet. Some clearcutting was done in these units in the early years of the sale, but it was not extensive. The stands are noticeably shorter, have more dead top trees, are not a dense, and contain a larger percentage of nonhost species.

RESULTS

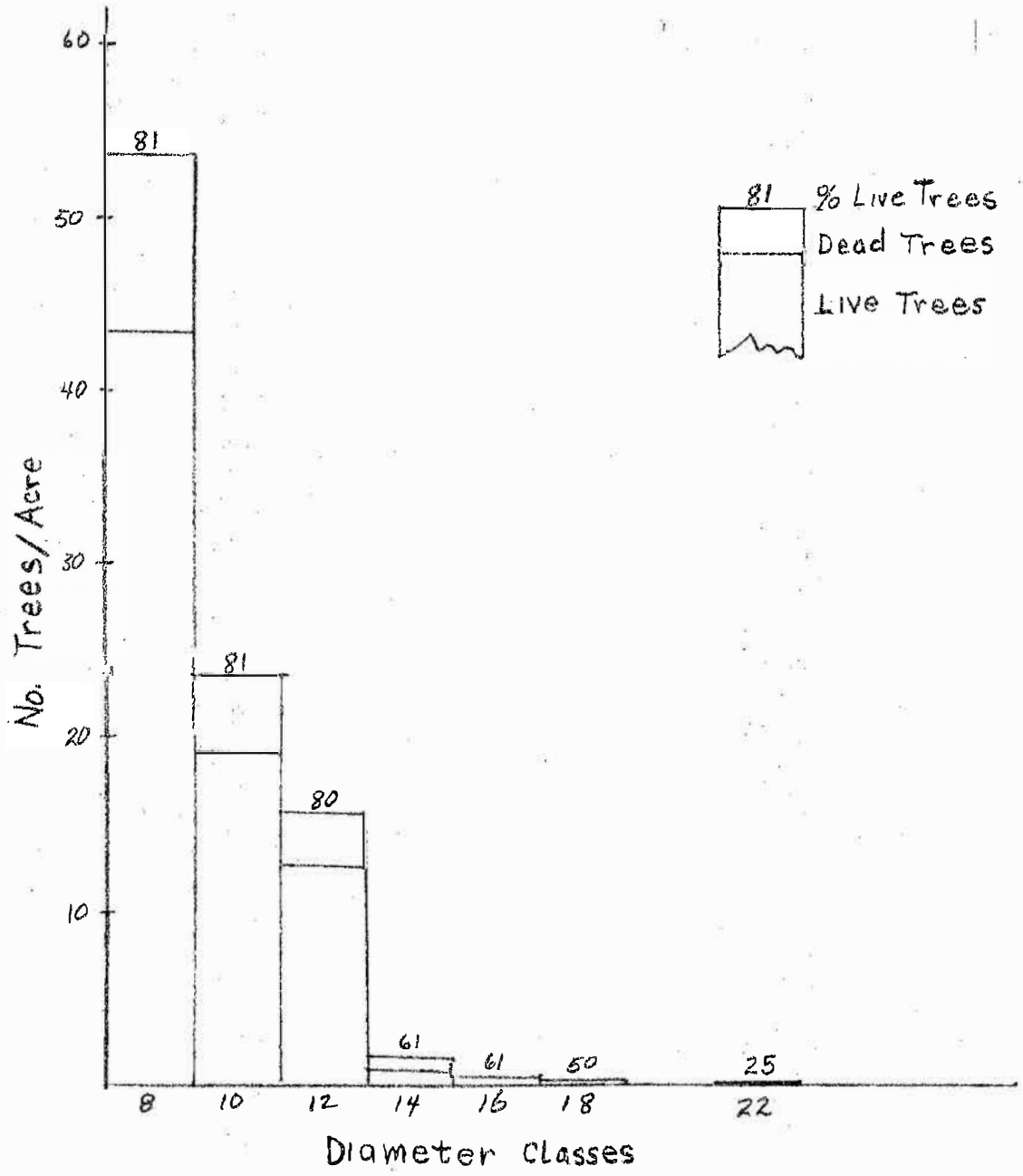
I. A. Chick Creek (Figure 1)

This unit averaged 190 trees per acre 6" and over and 96 8" and over, the fewest number of stems of any of the low elevation units (Table II). Over 75 percent of these are in the 6" and 8" diameter class. However, these factors do not seem to have limited the infestation to date. About 2 trees per acre were attacked in 1971 and 5 in 1972--a serious infestation level. The '71 and '72 level indicates that the mountain pine beetle was well established within the stand. The fact that there are 5 trees per acre currently infested and about 20% of the trees over 8" d.b.h. are dead is significant in that it indicates the infestation will probably decline and further losses will be low.

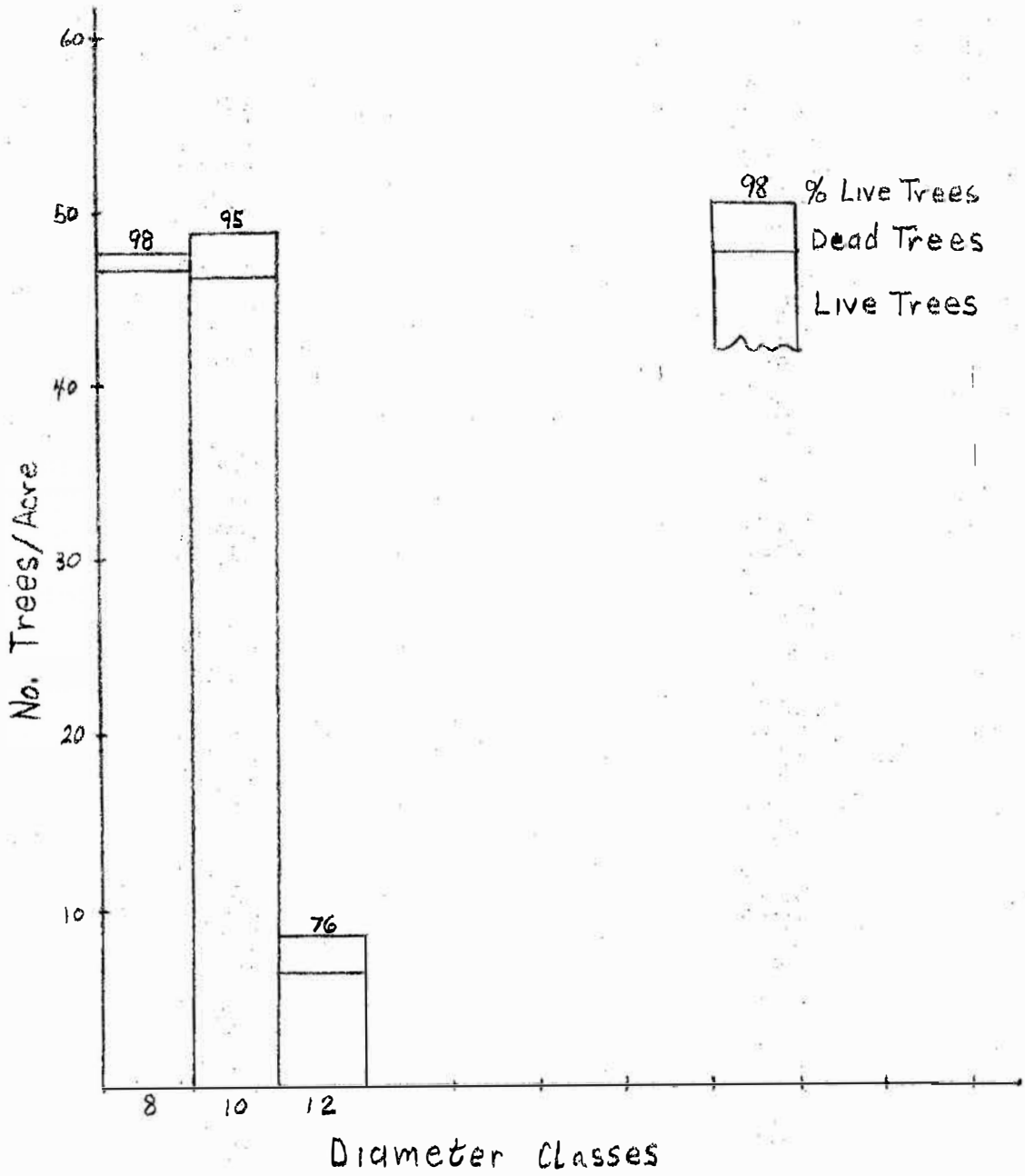
Two factors are significant in preparing a prescription for this area. Most important is the fact that a large amount of the unit has already been clearcut, and, therefore, additional cutting should await the establishment of regeneration in the cleared areas. Future cutting priorities have been set by past cutting rather than by the bark beetle infestation. The second factor is the stand structure. The trees over 12" d.b.h. are not numerous and occur as individuals scattered throughout the stand. A sizeable percentage of them have already been killed or are currently infested. This type of infestation will not contribute significantly to the beetle population in the future, nor will there be significant volume loss due to future insect attacks.

B. Split Creek (Figure 2)

This area is very similar to Chick Creek. With over 75 percent of the trees counted in the 6" and 8" diameter class. Only three green tree plots were measured indicating a total of 267 trees per acre with only 105 over 8". This small number of plots is probably statistically inadequate, yet the similarity of these figures to those of Chick Creek indicates some reliability. The current infestation was somewhat higher than Chick Creek, averaging about 8 trees per acre, but with so few trees in the larger diameter classes it is likely that this infestation too will soon decline.



Chick Creek (Figure 1)



Split Creek (Figure 2)

As mentioned above, current cutting on this unit has been discontinued until regeneration is established. The infestation, although high, is scattered and infested trees occur as individuals or small groups rather than in sizeable groups of large trees, as occurs in building infestations.

Both this and the Chick Creek units can be considered as the lowest priority for harvest.

C. Trude Siding (Figure 3)

This area has not been cut during this sale so that there are more trees than in the previously mentioned areas. However, as in other low elevation stands, a large percentage of the 308 trees per acre are in the smaller diameter classes, with only 142 trees 8" and over d.b.h. and over 80 percent in the 6" to 8" classes. As shown in Table II, the current infestation is at approximately the levels with Chick Creek and Split Creek.

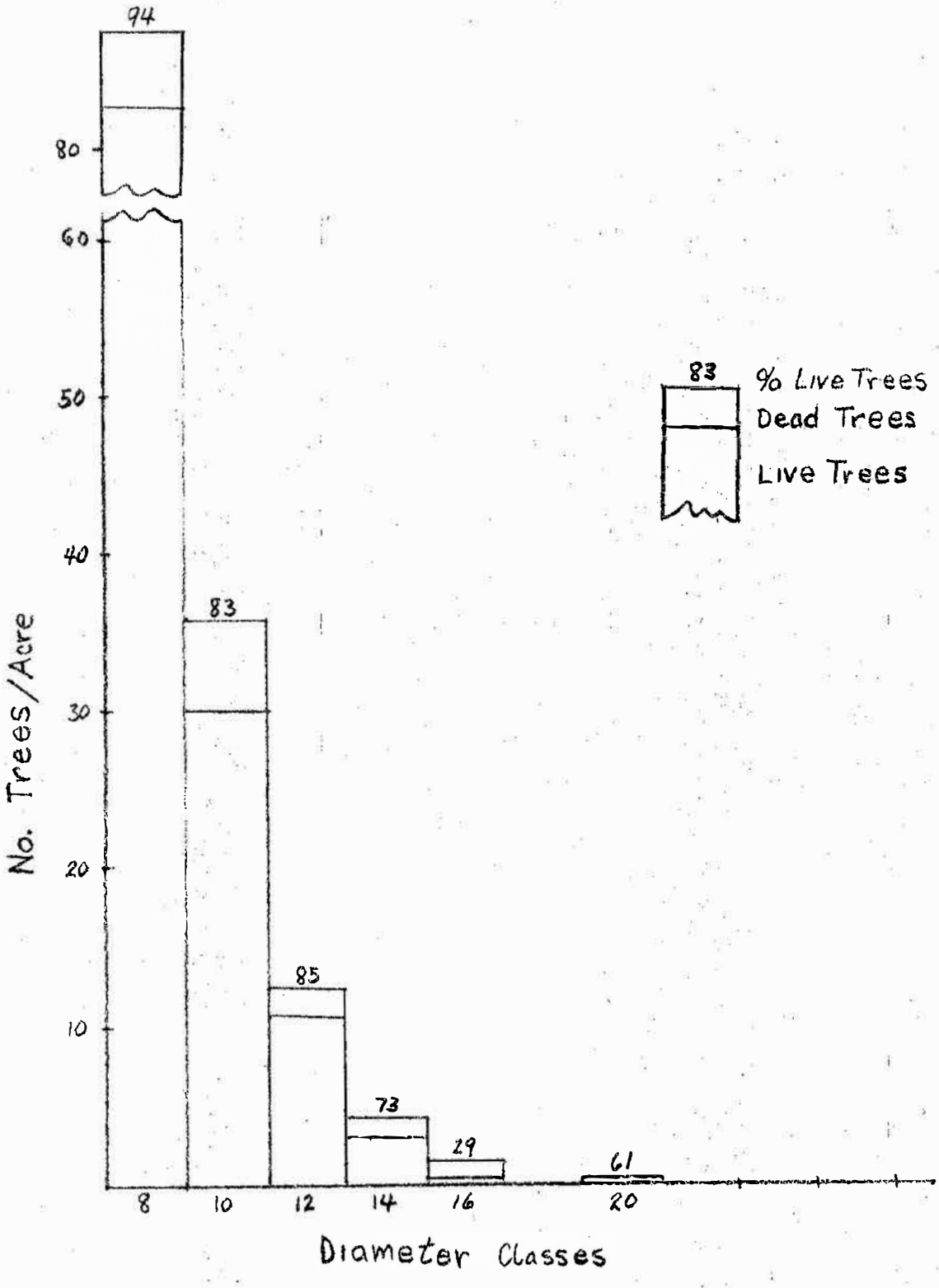
If the larger, quality volume is to be harvested from this area before it is lost, it should be cut as soon as possible. The high infestation level indicates that much of the volume in trees over 12 inches d.b.h. will probably be lost by 1974, but with over 100 trees per acre in the 8" to 10" classes, some substantial volume in these smaller sized trees will be available for harvest for the next 3 to 4 years.

II. Middle Fork (Figure 4)

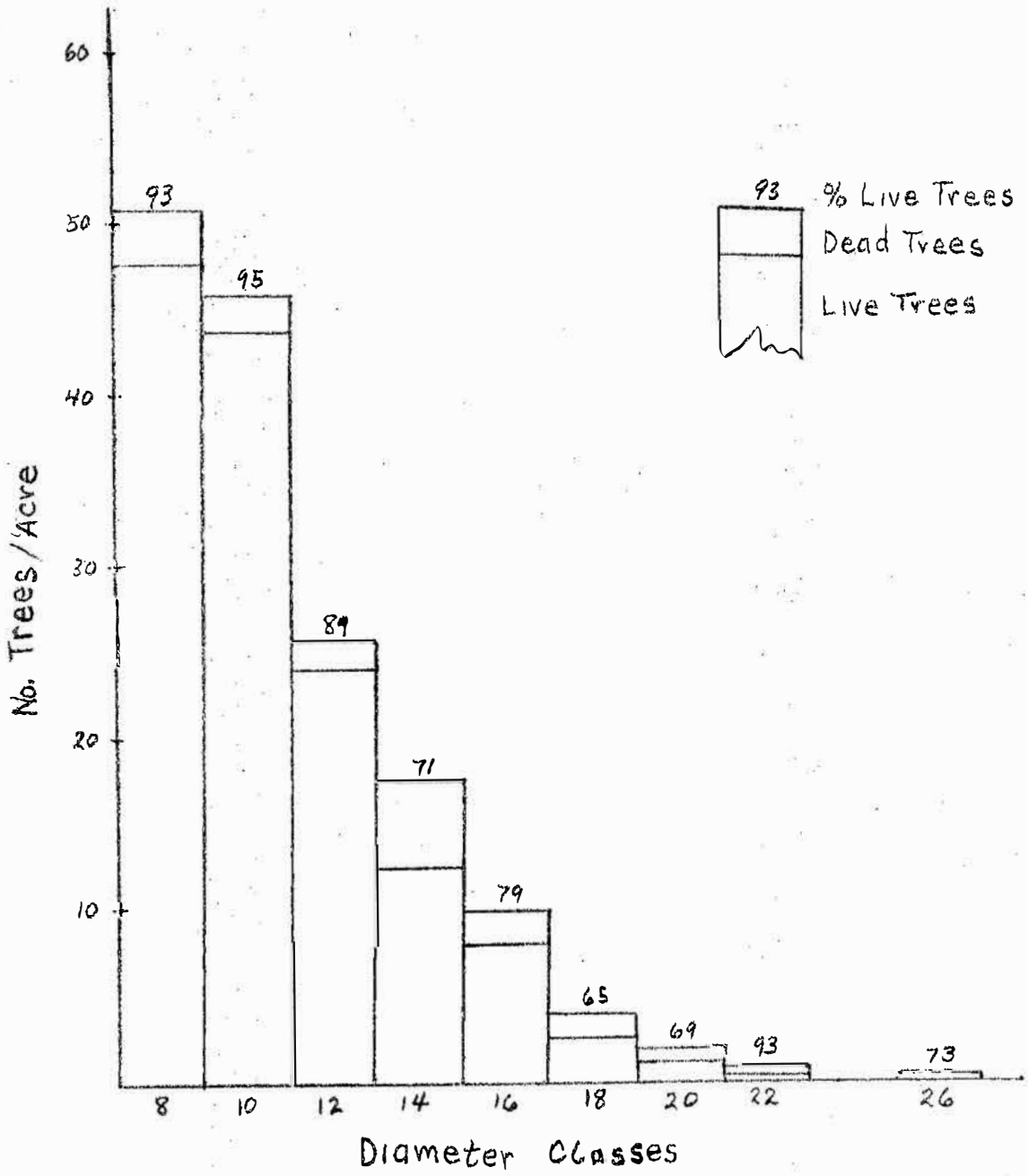
It was found that much of this stand was being cut during the 1972 season. All indications are that a better choice could not have been made. This area contains good volume, with over 150 trees per acre over 8" d.b.h., but also a high level of attacks per acre. Being the most southern portion of the sale area, the population pressure could be expected to be high. The 1971 level of infestation of 3.5 trees per acre was higher in this unit than in any other, and the 1972 level equalled the level in the low elevation stands of 5.4 trees per acre. The high infestation levels for two years, the substantial volume in trees over 12 inches d.b.h., and the exposure of the stand to surrounding population pressure all combine to make this one of the high priority cutting areas. The low buildup rate may indicate that elevation has had a tempering effect in the population increase.

III. Upper Chick Creek - South and North (Figures 5 & 6)

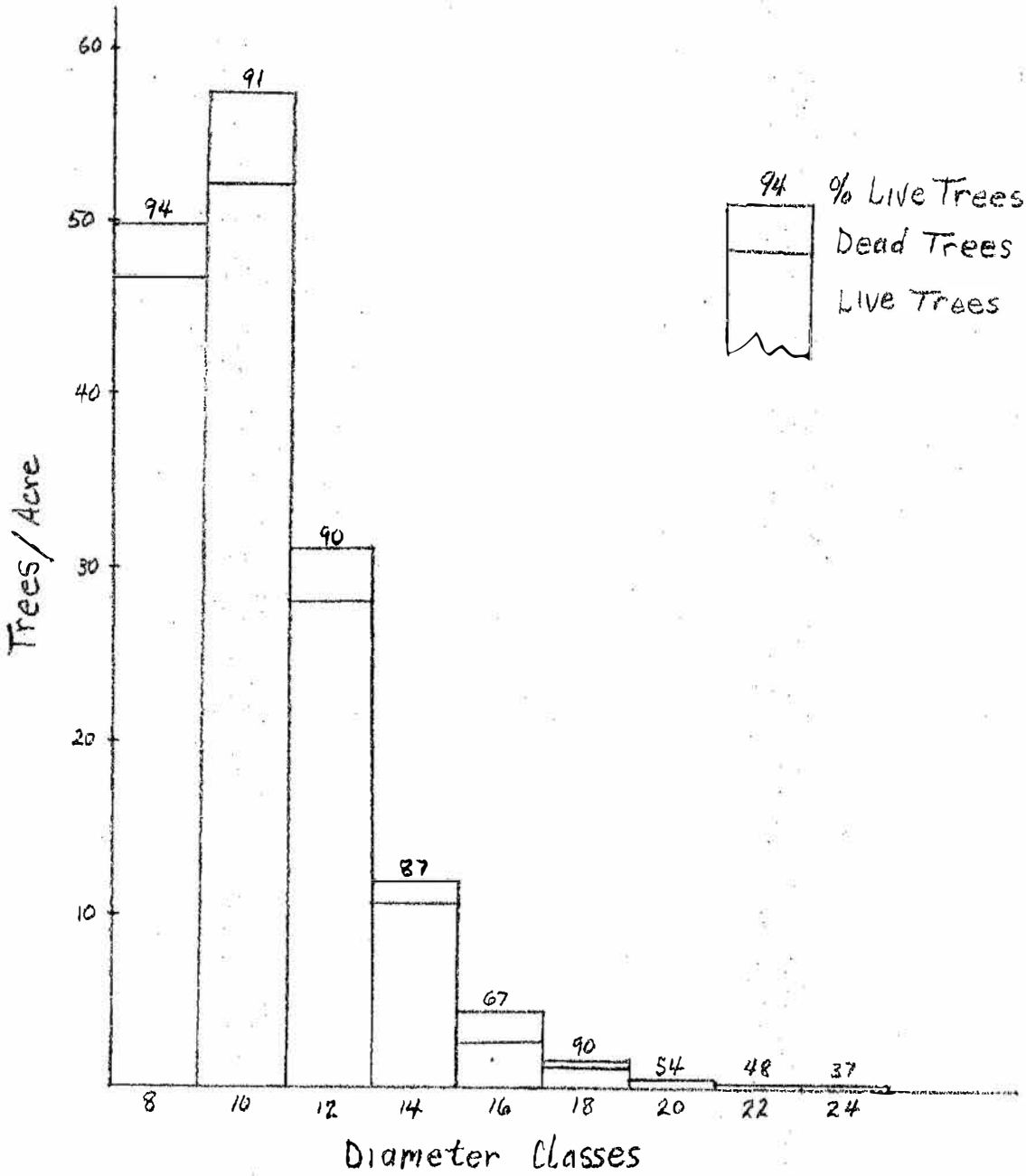
The stand data indicates that the Chick Creek units are similar to the Middle Fork unit. The total trees counted in all three units was from 167 to 176 trees per acre and from 138 to 156 trees



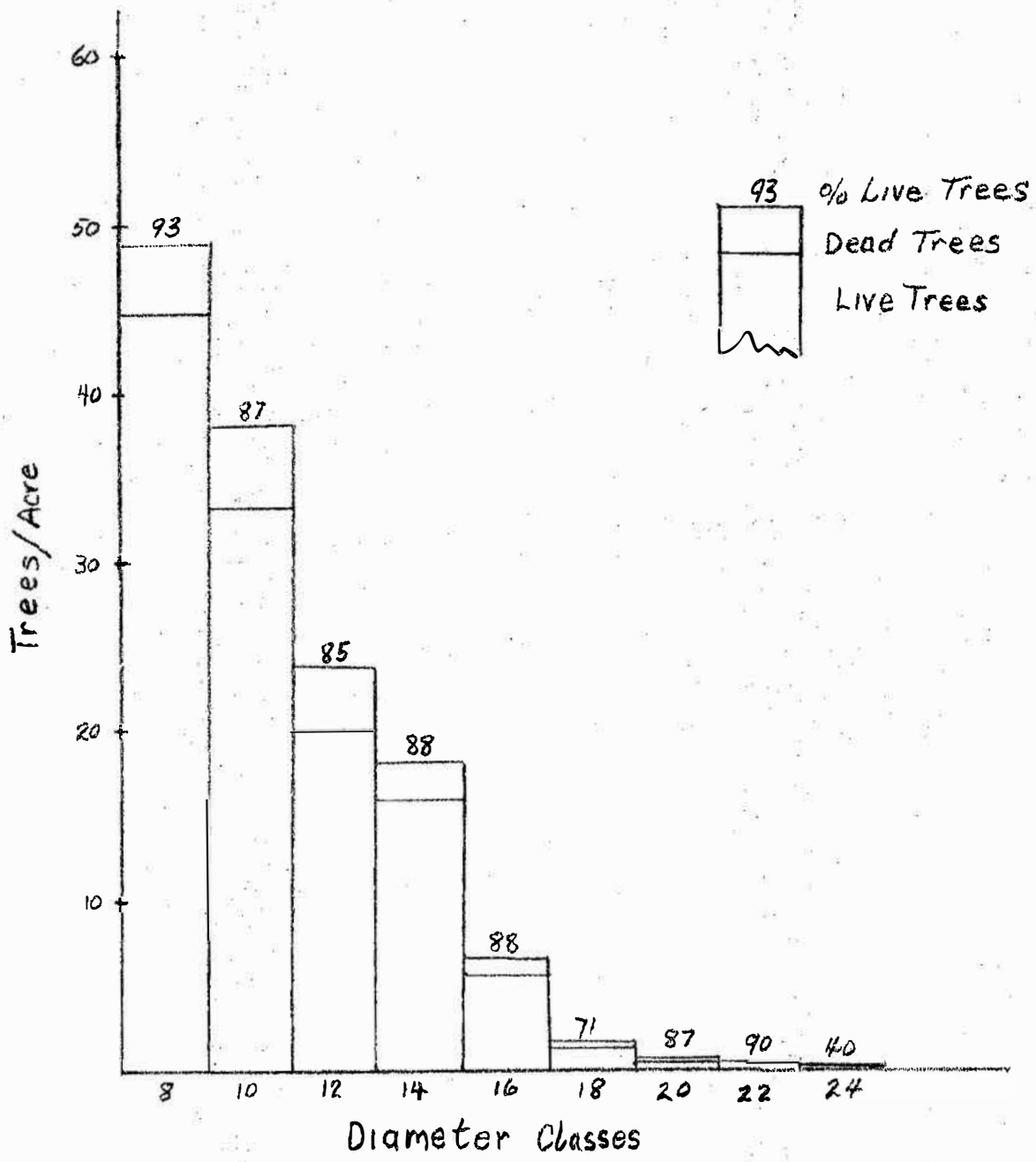
Trude Siding (Figure 3)



Middle Fork (Figure 4)



Upper Chick Creek - South (Figure 5)



Upper Chick Creek - North (Figure 6)

8 inches in diameter and larger (Table II). However, there was a significant difference in the average number of infested trees decreasing to the north as follows: Middle Fork = 5.4, S. Chick Creek = 3.0, N. Chick Creek = 1.3 (Table II).

The stand table indicates 42 trees per acre in diameters 12 through 16 which would provide significant volume as well as excellent host material and, therefore, should be considered for early harvest. However, the survey indicated that over 20% of the areas had already been clearcut.

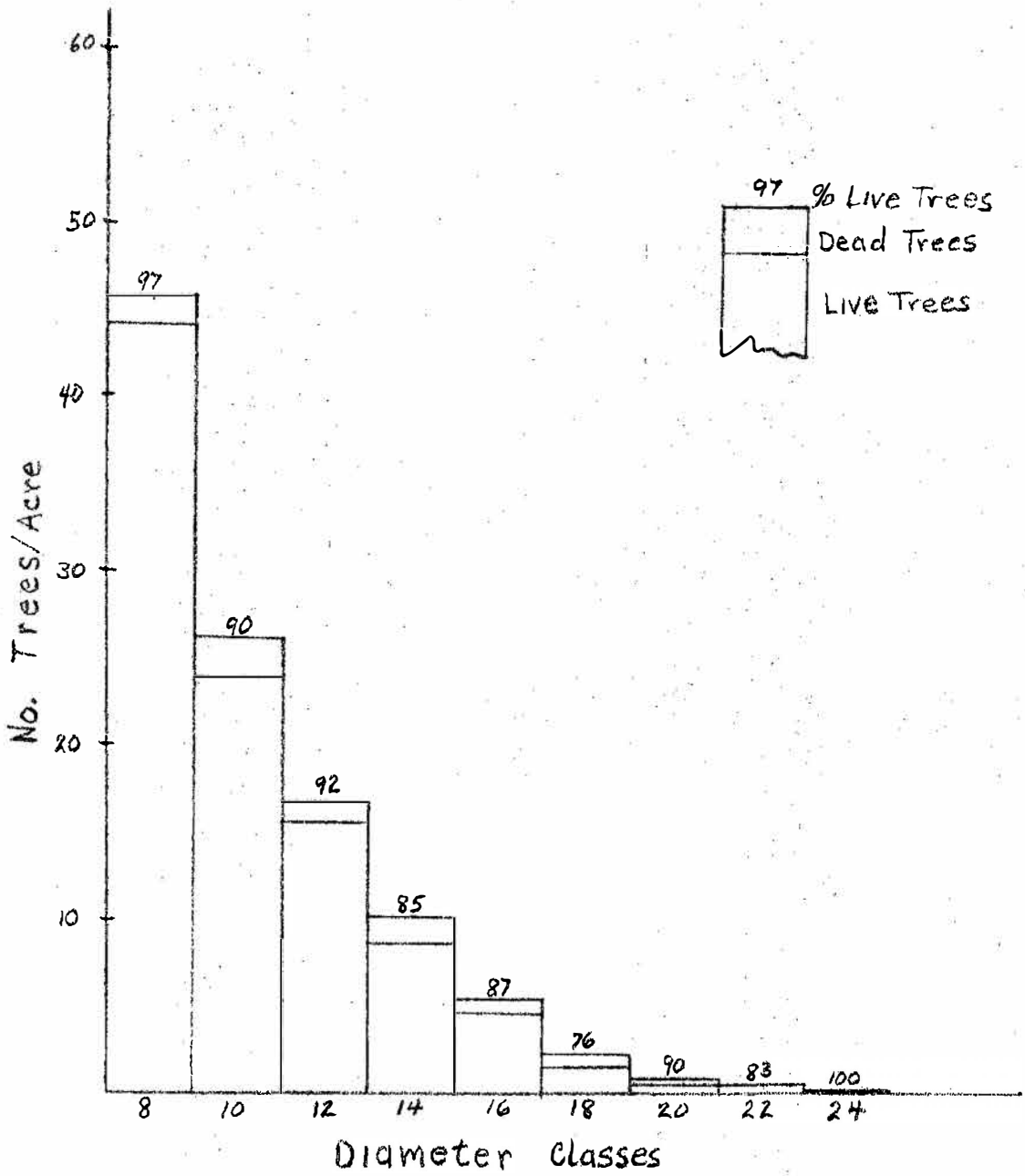
The intervening strip between the 5-chain-wide clearcut units would normally be allowed to remain uncut as a seed source and site protection, without substantial losses, until the cut area was regenerated as in lower Chick and Split Creek. Invasion by the mountain pine beetle could cause significant enough changes in this residual stand that the land manager may now wish to reconsider his prescription for the area.

The value of the residual stand as a seed source should be considered against the loss in value of the volume which could be harvested, plus the hazard to the additional volume in adjacent units from brood reared in these trees. Unfortunately, the decision must be made from opinion rather than facts since factual data on such values is not available. We are neither able to project the actual loss which the beetle will cause nor are we able to determine the need for the volume to fulfill the sale commitment.

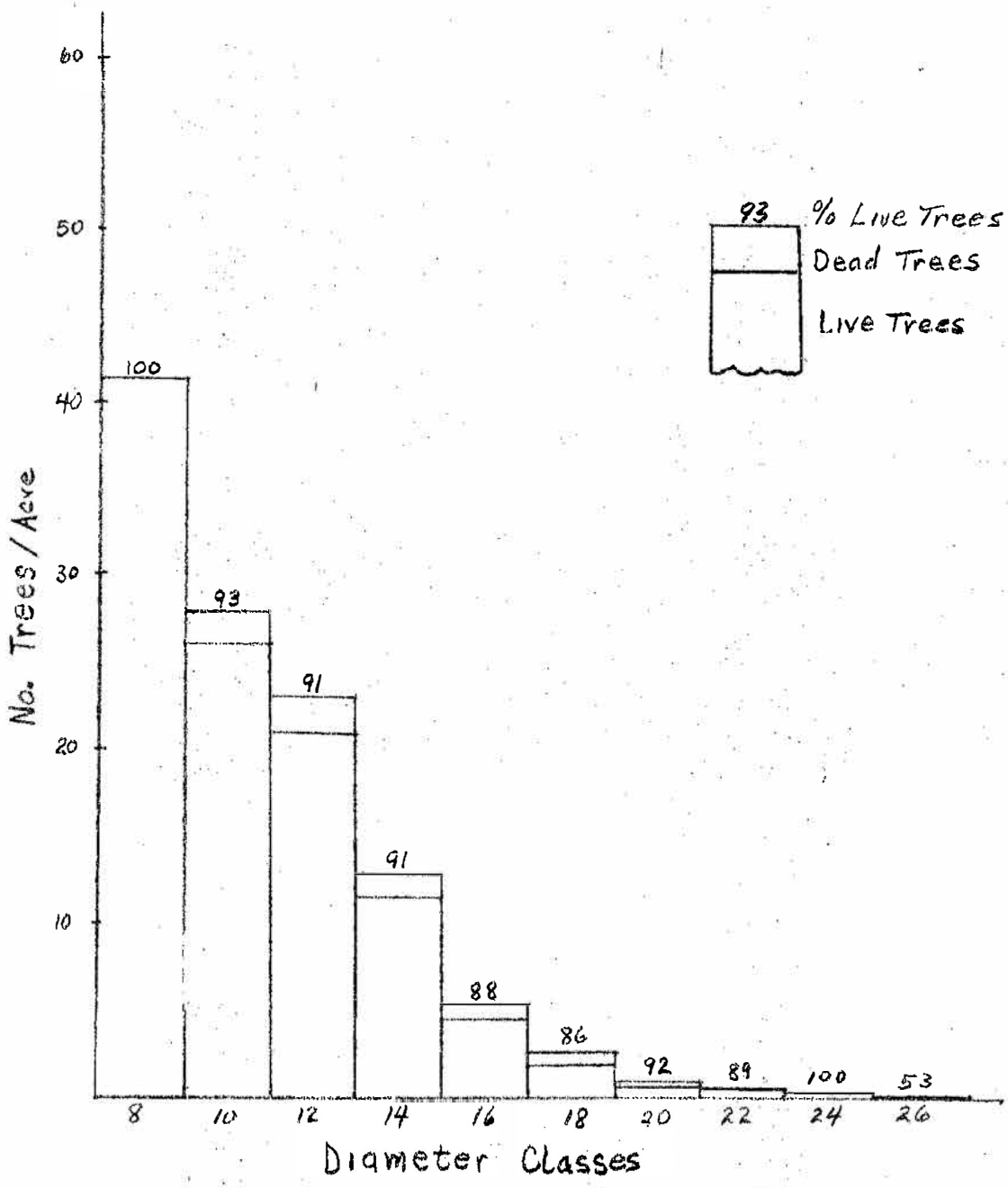
IV. Upper Moose Creek (Figure 7 & 8)

Although some of the Moose Creek unit has been cut, most of the area is yet to be harvested. About 50 to 60 of the 167 trees per acre are in the 6" diameter class and mortality thus far has been low with only about two trees per acre currently infested--an increase from about 1/2 a tree per acre in 1971.

This area should receive a high priority for cutting following the Middle Fork and Trude Siding. Infested trees will produce a significant increase in broods for the next 2 years plus the fact that this unit is adjacent to Chick Creek unit, a possible additional source of attacking beetle populations. Elevation may play some part in the reduction of population numbers, dependent upon the variations in temperatures and length of warm seasons. However, this area lies between 7,200 and 7,600 feet so that except for unusual conditions, weather should not be considered to be a factor.



Upper Moose Creek No. 1 (Figure 7)



Upper Moose Creek No. 2 (Figure 8)

V. Upper and Lower Black Canyon (Figures 9 & 10)

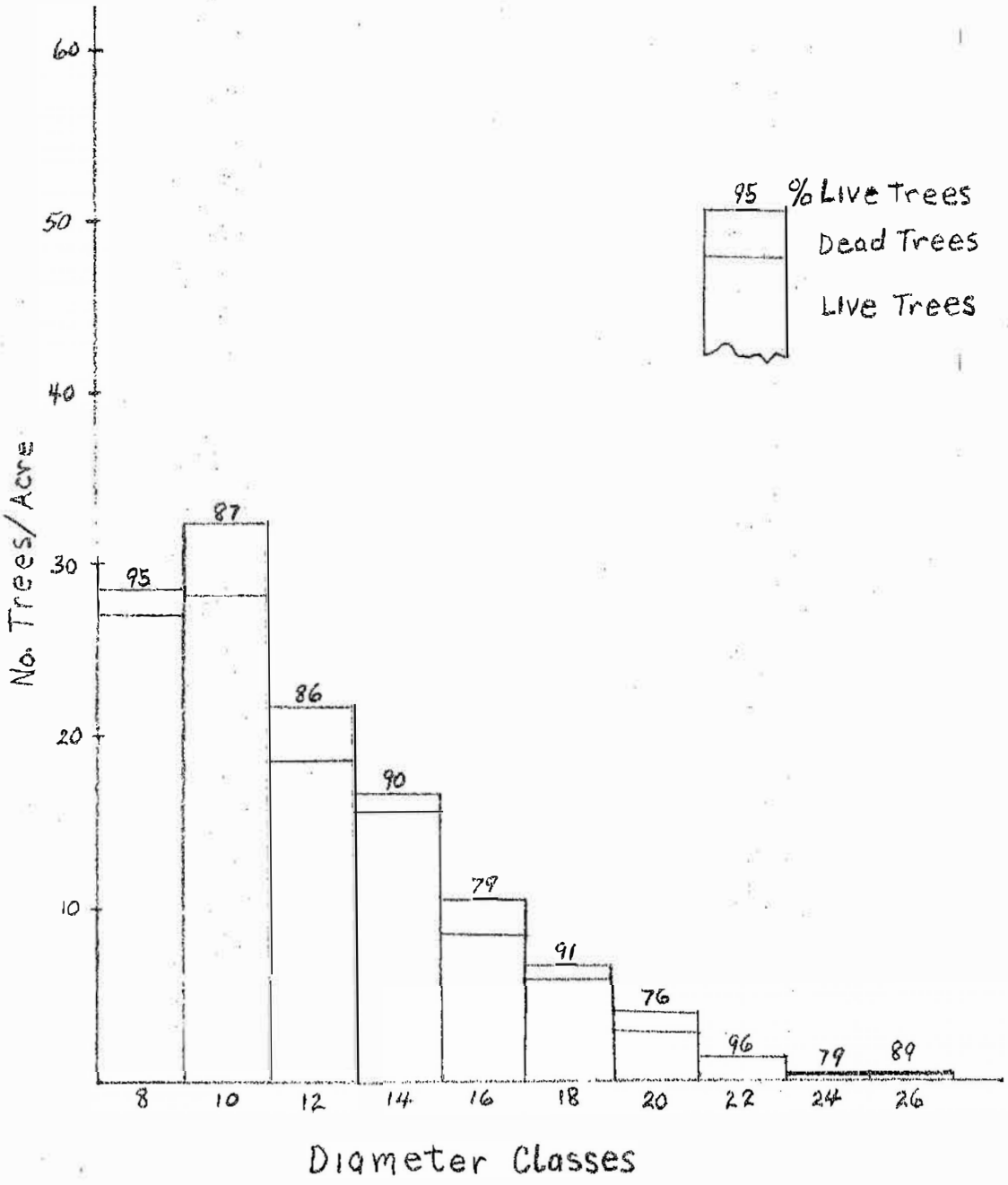
Much of this unit is close to or above 8,000 feet elevation, and the most distant from the present beetle population centers; two factors which tend to reduce the potential of the infestation. These two factors are offset to some degree, however, by the fact that a large portion of the volume is in larger diameter trees. This means that trees which become infested are capable of producing significantly increased broods, unless early or late cold weather restricts their development. If a significant number of beetles remain in brood trees for 2 years, characteristic of some high elevation stands, the brood emergence will probably be less than the number of parent beetles making attacks. The current infestation then becomes dependent on the number of new beetles which fly into the area from surrounding areas of populations.

Because of the effects of temperature and elevation, the priority for harvesting this unit would be less than the units which are under 8,000 feet.

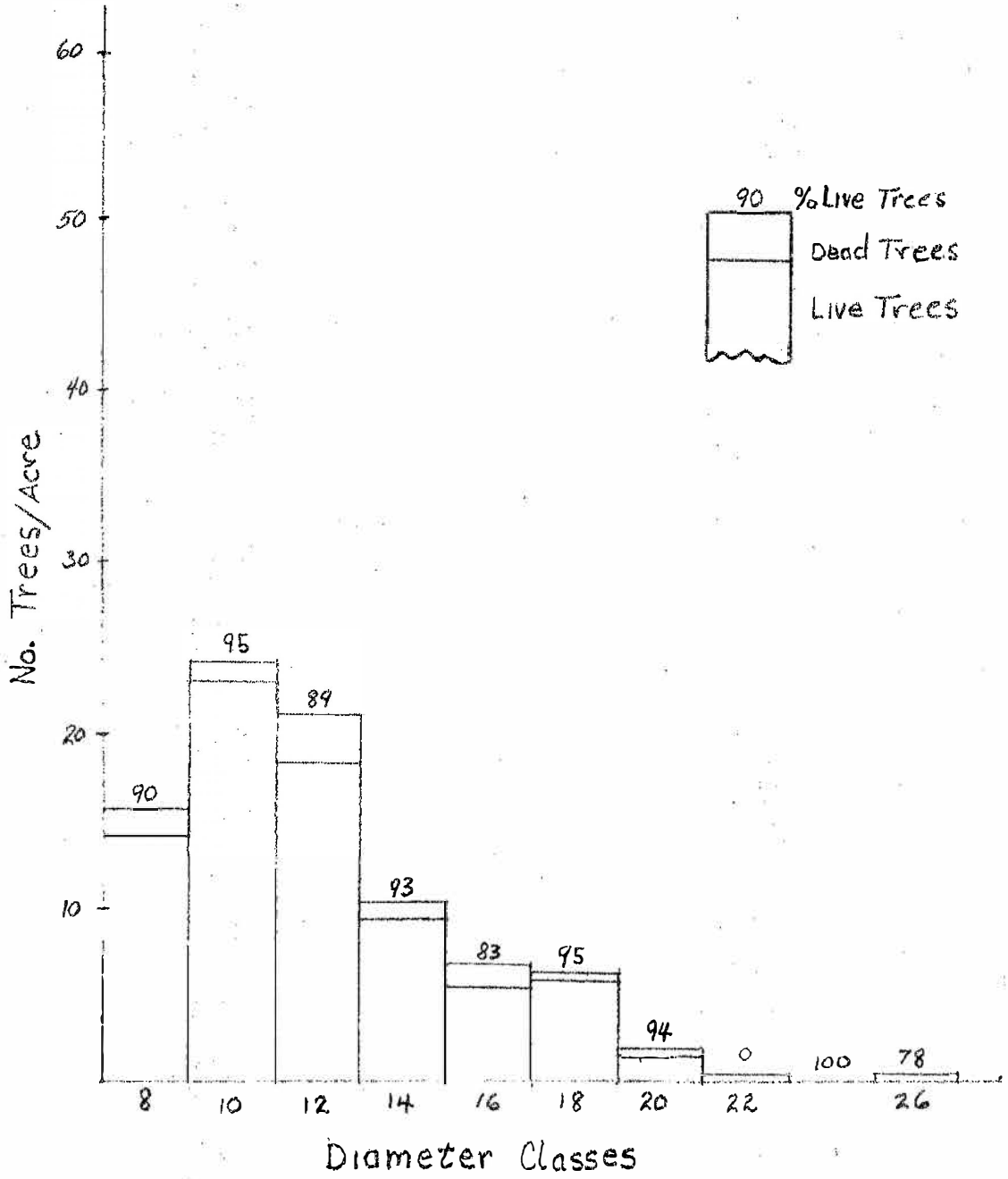
SUMMARY

The units are listed in the order of their priority for cutting relative to expected beetle mortality and brood production for 1973.

1. Middle Fork
2. Trude Siding
3. Moose Creek
4. Black Canyon
5. Upper Chick Creek
6. Low priority - Split Creek, Chick Creek.



Upper Black Canyon (Figure 9)



Lower Black Canyon (Figure 10)

TABLE I Stand and Attack Information

by Diameter Class

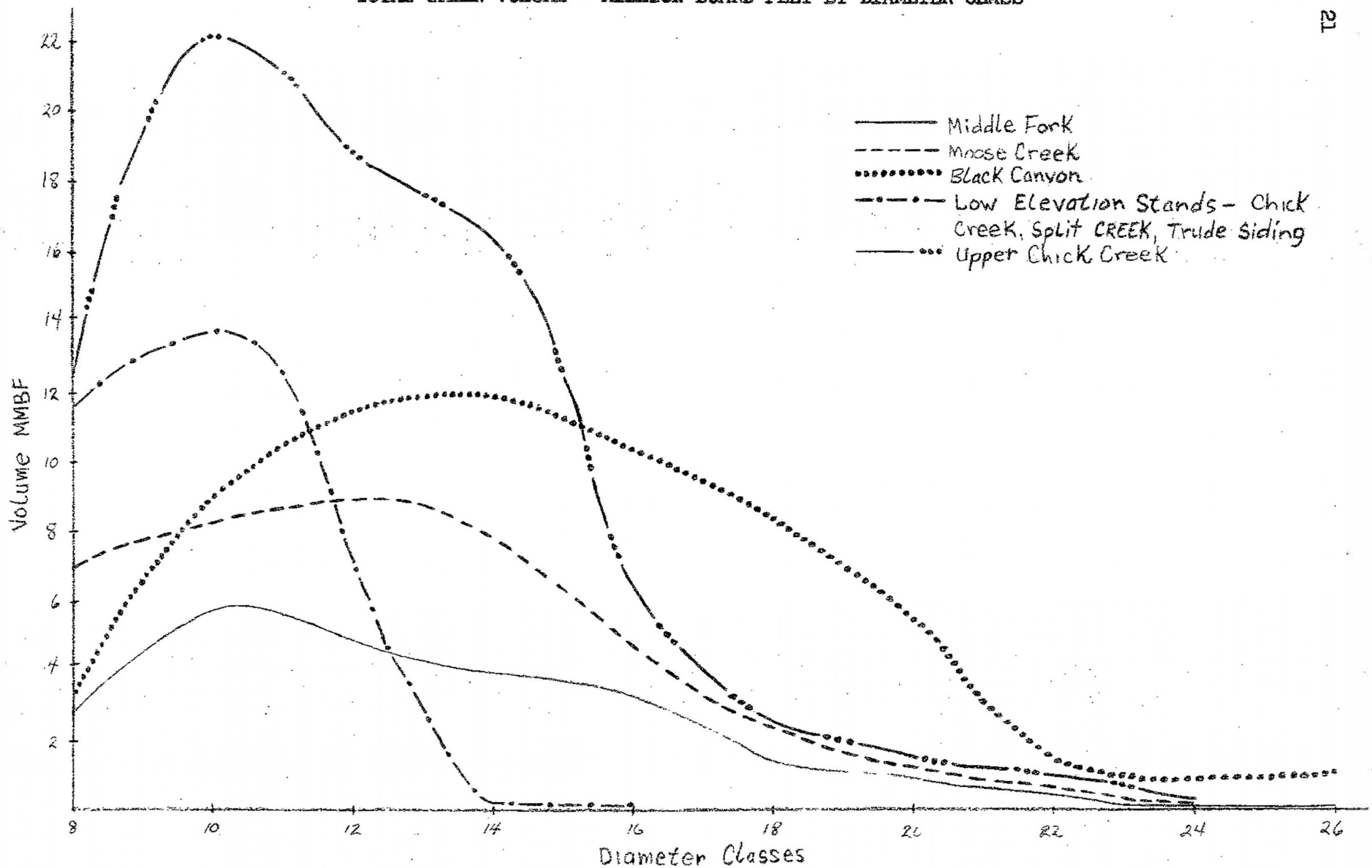
Tree Diameter	Total T/A	Percent of Stand	'71-'72 Attacks T/A	Percent Killed '71-'72	Total Dead T/A	Percent Dead
6	62.2	33.3	0.15	0.23	5.37	8.1
8	46.5	25.0	0.31	0.65	2.89	6.0
10	34.6	18.5	0.86	2.34	3.77	10.2
12	21.8	11.7	1.02	4.37	2.60	11.1
14	12.1	6.5	0.73	5.53	1.77	13.4
16	5.5	2.9	0.45	7.31	1.03	16.7
18	2.4	1.3	0.18	6.84	0.38	14.4
20	0.9	0.5	0.15	13.63	0.20	18.1
22	0.4	0.2	0.07	14.50	0.08	16.6
24	0.1	0.1	0.01	6.60	0.02	13.3
26	0.1		0.02	18.10	0.02	18.1

TABLE II

SUMMATION OF STAND DATA BY UNITS

	Unit Name	Acres	Estimated Green Volume MBF	No. Variable Plots	Green Trees/A	Attacks 1972 Trees/A	Attacks 1971 Trees/A	Dead Trees/A	Total Stand	Total Trees 8" d.b.h. and Above	Total No. Trees 12"-18"
I.	A. Chick Cr.	2,800	13,726	45	157.31	5.06	1.94	25.84	190.15	96	
	B. Split Cr.	1,950	11,583	3	223.96	8.00	1.41	33.95	267.32	105	15.4
	C. Trude Siding	1,300	9,435	26	253.13	5.17	1.45	48.09	307.84	142	
		6,050	34,744	74							
II.	Middle Fork	1,750	24,159	30	170.85	5.40	3.53	10.48	190.26	158	58.2
III.	Upper Chick S	3,360	40,196	62	175.50	3.30	1.62	11.94	192.36	156	49.4
	Upper Chick N	3,550	41,098	75	167.12	1.34	0.84	16.20	185.50	138	
		6,910	81,294	137							
IV.	Upper Moose 1	2,240	19,450	90	159.31	2.11	0.46	5.58	167.46	106	38.4
	Upper Moose 2	2,170	22,318	84	161.26	1.86	0.63	3.62	167.37	114	
		4,410	41,768	174							
V.	Lower Black Canyon	2,640	27,527	18	148.82	1.75	0.75	11.52	162.84	88	50.0
	Upper Black Canyon	2,560	36,419	37	138.69	2.06	0.46	20.14	161.39	124	
		5,200	63,946	55							
			245,911 M								

TOTAL GREEN VOLUME - MILLION BOARD FEET BY DIAMETER CLASS



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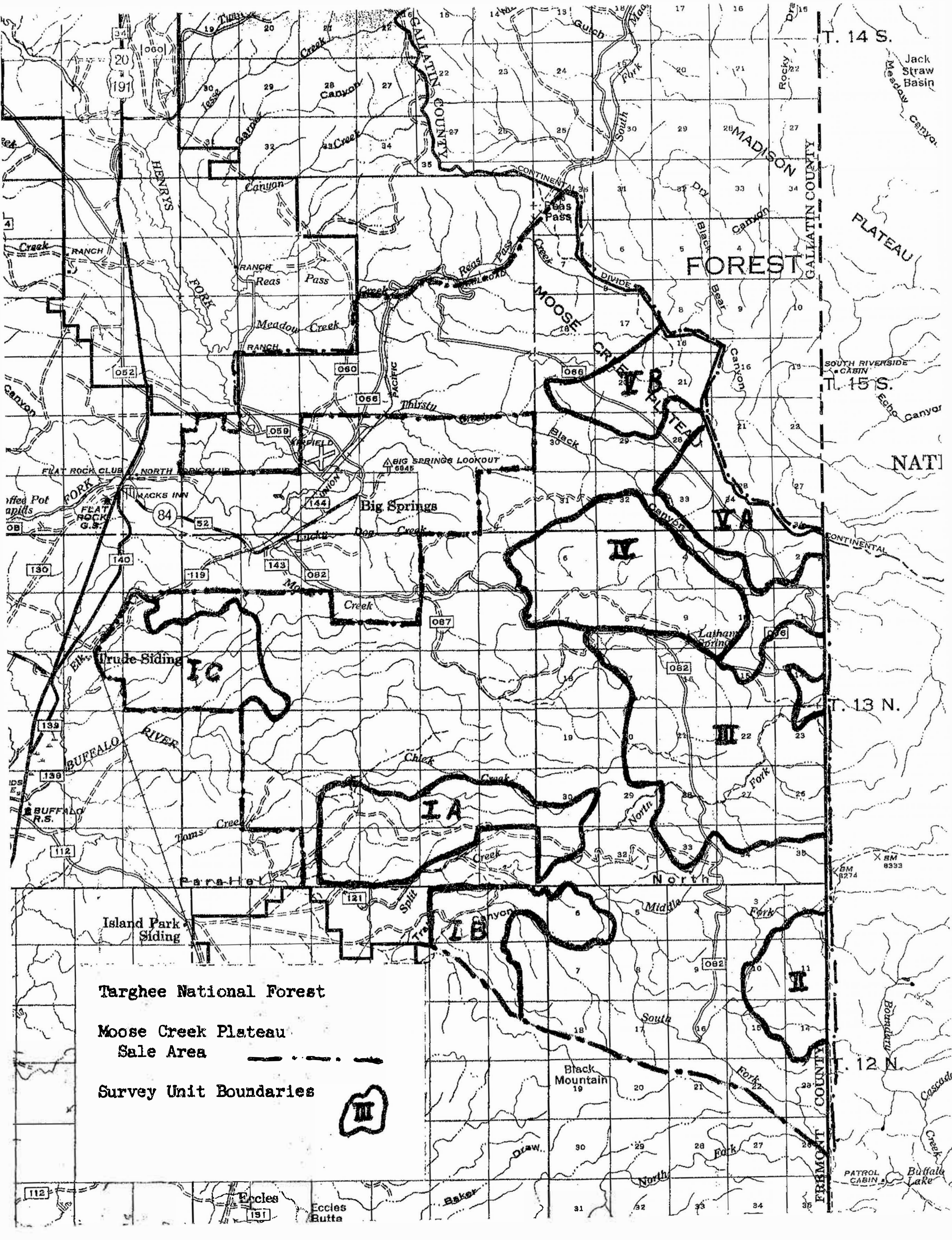
2. Parker, Douglas L., 1973. Evaluation of Plots Used During Mountain Pine Beetle Surveys. U. S. Department of Agruculture, U. S. Forest Service, Ogden, Utah. 4 pp., illus.


Targhee National Forest
Moose Creek Plateau
Sale Area
Survey Unit Boundaries
III
IA
IB
IC
II
III
IV
VA
VB
T. 14 S.
T. 15 S.
T. 13 N.
T. 12 N.
GALLATIN COUNTY
MADISON
FREMONT COUNTY
FOREST
PLATEAU
MOOSE CREEK PLATEAU
CONTINENTAL DIVIDE
Reas Pass
Big Springs
BIG SPRINGS LOOKOUT
MACKS INN
FLAT ROCK CLUB
Trude Siding
Island Park Siding
Black Mountain
Eccles
Eccles Butte
Jack Straw Basin
SOUTH RIVERSIDE CABIN
PATROL CABIN
Buffalo Lake
BUFFALO RIVER
BUFFALO R.S.
HENRYS FORK
Thirsty Creek
Lucky Dog Creek
Moose Creek
Meadow Creek
Latham Spring
Black Canyon
Boundary Creek
Echo Canyon
Cascade Creek
Parallel
North
Middle Fork
South Fork
North Fork
NATI